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*Achieving Interoperability Through Cooperation and Coordination*

**Special Assignment Technical  
Report**  
*800-MHz Interference Survey  
Response*

**Final**

**November 2000**

### **3.0 SUMMARY OF RESPONSES TO APCO/RADIO RESOURCE SURVEYS**

#### **3.1 Background**

Public Safety users in the 800 megahertz (MHz) band (mobile/portable transmit-806–824 MHz and mobile/portable receive-851–869 MHz) are experiencing radio frequency interference from commercial wireless systems in adjacent frequency bands. When the public safety community initially began using the 800-MHz band, cellular systems were not in use. However, the proliferation of cellular systems and the increased public safety demand for spectrum in the 800-MHz band have resulted in unacceptable radio interference to the public safety users.

To identify the scope and nature of the growing interference trend, the Federal Communications Commission (FCC) requested that an independent task force be created to address the issue. The group that is still analyzing the interference problem includes Motorola; the Association of Public-Safety Communications Officials, International, Inc. (APCO); Nextel; the Cellular Telecommunications Industry Association; and the Public Safety Wireless Network (PSWN) Program. To determine the severity of the problem, APCO disseminated a request for information and then requested assistance from the PSWN Program to analyze the survey responses.

#### **3.2 Findings and Recommendations**

Thirty-six agencies responded to the survey; 21 respondents specifically identified Nextel operations as the source of interference. One organization reported that interference was caused by paging operations and other commercial transmissions. Another stated that interference was caused by other public safety users. One respondent did not provide source of interference. The remaining 12 organizations identified the interference source as cellular operations. The reports of the interference originated from areas throughout the United States, plus one report from Victoria, British Columbia. The majority of the interference problems have not been resolved.

Mr. Joe Kuran, the Technical Systems Manager for the Washington County Consolidated Communications Agency (WCCCA) near the Portland, Oregon, area has been working with Nextel engineers since 1998 to resolve the interference with their 800-MHz

simulcast trunked radio system. Although Nextel has instituted a number of engineering solutions to resolve the problem at specific locations, e.g., discontinuing use of certain transmitters or reducing transmitter power, the interference is still present at many sites. Mr. Kuran, who is also the Oregon APCO Frequency Coordinator, also noted that Snohomish County in Washington State is considering putting its \$22 million Motorola radio contract on hold until Motorola can guarantee that the radio system will not be affected by Nextel interference. He also commented that Portland is working on a resolution that would prevent Nextel from obtaining additional tower permits.

Other examples of the interference problem include the following:

- Gladstone, Missouri, Public Safety Department's conventional system. Interference from Nextel has eliminated that agency's ability to use their system.
- Phoenix, Arizona, Police/Fire Department mobile data system. Wideband digital signals from Nextel prevent operations within a  $\frac{3}{4}$ -mile radius of the Nextel tower. Nextel has installed more than 60 towers in the Phoenix area. Interference is caused by wideband sideband noise (70 percent) and simple front-end overload (30 percent) to the mobile receiver when it is in the vicinity of Nextel towers.
- Victoria, British Columbia, Canada, Police Department conventional system. Since a commercial carrier, Clearnet, installed an IDEN system, complaints such as inability of portable radios to access repeaters, static in mobiles, and blocking have been reported. Plans to install a trunked system may be put on hold until more information is received concerning the interference problems occurring in the United States.
- Lewiston/Auburn, Maine, 911 emergency system. Interference was reported from paging and other types of commercial transmissions. To resolve the interference problems, transmitter sites are being relocated and more voted receiver sites are being added. City ordinances are also being drafted to address the issue.
- King County, Washington, Police, Fire, EMS, Public Works trunked system. To resolve the interference, Nextel has reduced transmitter power, removed some frequencies, changed antennas, and up tilted the new antennas. As a result of these changes, the two-block area around the King County tower site is now usable.

- Savannah, Georgia, trunked system. Because Nextel is using frequencies near the control channels, radios do not receive the control channel signal. Filters have been installed; however, the problem is still present. Savannah is studying the possibility of moving its control channels to the middle of the band to avoid the receiver desensitization. This procedure is very time-consuming and expensive because more than 2,000 subscriber units must be reprogrammed. Because this change requires the concurrence of two separate governments, a great deal of coordination is required.

The primary complaint was desensitization or overload of mobile and portable radio receivers when in the vicinity of cellular antennas. One cause of this desensitization could be intermodulation due to interactions of different frequencies. However, it is more likely that the interference is the result of strong signals from commercial systems transmitting on frequencies near public safety frequencies.

This interference can be traced to the different design modes used by commercial systems and public safety systems. Public safety systems are designed to provide a maximum wireless service coverage area with minimum impact on spectrum usage and taxpayer dollars. They are designed to maximize coverage from a centrally located base station. Mobile radios in the extremes of the coverage area are close to their maximum vulnerability to interfering signals. Commercial systems are designed to hand-off mobiles well before they reach a threshold signal level. Therefore, base station transmitters are placed in relatively close proximity providing strong signal overlap to ensure continuous coverage for a mobile.

The respondents to the APCO survey did not provide sufficient detail to fully determine all causes of the interference. To adequately address the issue, the following additional information is required:

- Location of the public safety users in relation to their transmitter
- Location of the public safety users in relation to the interference source
- Specific frequencies used by public safety and commercial systems
- Public safety and commercial system design criteria
- Technical characteristics of the public safety and commercial equipment

- Live on-the-air measurements to determine the severity of the interference.

Because of the close proximity of commercial wireless and public safety spectrum and the different systems designs, it is unlikely that one-size-fits-all solutions to the interference problem will be possible. However, some potential problems could be resolved if coordination is effected between public safety users and commercial system providers prior to installation of a new system.

APCO Survey Results						
Location	Agency Name	Type of Service	Type of System	Frequency	Interference Source	Resolution
Chandler	City of Chandler	Police, Fire, and Public Works	Trunked 800-MHz, MDT Data 800-MHz	806-821	Nextel, and possibly others	None
Phoenix	Phoenix Police and Fire Dept.	Police and Fire	Mobile Data	821-824	Nextel	None
Victoria Ontario	Corp of the City of Victoria	Police, Fire, EMS, Public Works	Conventional VHF	N/A	Clearnet?	None
	N/A	Police, Fire, EMS, Public Works	N/A	N/A	N/A	N/A
Richmond	State Department of Transportation	Public Safety/Special Emergency	Trunked, Analog, Voice	806-821	Nextel?	None
Denver	Denver Police Department EEB	Police, Fire, EMS, and Public Works	Trunked Analog and Digital Voice with MDTs	806-821	Nextel and possibly cellular	None
Lakewood	Lakewood PD, West Metro FD	Police, Fire, EMS, Public Works, Parks, College Security, and Mail Security	Trunked, Analog, and Digital Voice	821-824	Nextel	None
Ft. Lauderdale	City of Fort Lauderdale	Police, Fire, EMS, Public Works, and Beach Patrol	Trunked	821-824	Nextel	None
Ft. Lauderdale	Broward County Telecommunications	Police, Fire, EMS, and Local Government	Trunked, Simulcast, Voice, and Analog	806-821	Cellular sites	None
Largo	Pinellas County Government - Radio Division	Police, Fire, EMS, and Public Works	Trunked Analog Voice System	806-821	Nextel	RFI addressed on case-by-case basis. Nextel then changes frequency
Miami	Information Technology Department	Police, Fire, EMS, Local Government, Public Works, and Transit	Trunked, Analog, and Digital	N/A	Nextel	None
Orlando	Orange County Sheriff's Office	Sheriff	Analog 806/821, Trunked	806-821	Nextel, Oria Vista Site	None
Stuart	Martin County Fire Rescue	Fire and Rescue	Trunked 800	821-824	N/A	N/A
Atlanta	Fulton County Emergency Communications	Police, Fire, EMS, Public Works	Trunked, Analog, Data	806-821	Cellular providers in Fulton Industrial Boulevard Area	None
DeKalb County	DeKalb County Public Safety	All public safety	Trunked	806-821	Nextel and Southern Linc	None
Douglasville	City of Douglasville	Police, Fire, Hospital, and Public Works	Trunked	806-824	Cell Towers	None
Savannah	City of Savannah	Police, Fire, EMS, Public Works, and City	Motorola 800-MHz, Smartzone Analog	806-824	Nextel	None

Figure 3-1  
APCO Survey Results

Location	Agency Name	Type of Service	Type of System	Frequency	Interference Source	Resolution
Lahaina/Kihei HI	Maui County Police Department	Police, Fire, EMS, Public Works Police, Fire, EMS, Wastewater Water District, Airport, and County Bus Security	Trunked Analog Trunking System and Mobile Data System	821-824 806-824	Nextel Nextel and some other identified source	None None
Baton Rouge LA	Louisiana State Police	State Police/Other State and Federal	Trunked	806-824	N/A	None
Duxbury MA	N/A					
Baltimore MD	N/A	Police, Fire, Public Works, Schools, Highways, Utilities	Trunked	806-821	Nextel	None
Auburn and Lewiston ME	Lewiston/Auburn 911 Emergency Comm	Police, Fire, EMS, Public Works, and City	Digital, Motorola Astro	N/A	Paging, and other commercial transmissions	Relocating transmitters and adding voting receivers
Howell MI	Michigan State Police	Police, Fire, EMS, and Public Works	APCO 25 Compliant Digital Trunked	821-824	Cellular 870-MHz Band	None
Gladstone MO	Gladstone Department - Public Safety	Police, Fire, EMS, Public Works Police, Fire, EMS, Public Works, Inspections, and General Government	Conventional	806-821	Licensed Nextel tower site in Liberty	None
Cary NC	Town of Cary		Analog Trunked	806-821	N/A	None
Tigard OR	WCCCA	Police, Fire, and EMS	MDT and Analog Trunked	806-824	Nextel	None
Memphis TN	City of Memphis	Police, Fire, EMS, Public Works, Gen. Services, Park, and Local Government	Trunked	821-824	N/A	None
Missouri City TX	Missouri City Police Department Wiztronics, Inc (Private) Backup for public safety system	Police, Fire, EMS, and Public Works	Trunked Analog	806-821	N/A	N/A
Bellingham WA		Fire, Public Works	Trunked, Analog, Voice	N/A	Nextel	None
Seattle WA	City of Seattle	Police, Fire, EMS, Public Works	SmartZone trunked system and Motorola/MDI MDT system	806-821	Nextel Site at 45th and Roosevelt	None Nextel reduced power, removed some frequencies, changed antennas and uplited new antennas
Seattle WA	King County	Police, Fire, EMS, and Public Works	Analog and Digital Trunked, MDT	806-824	Nextel	None
Seattle WA	Port of Seattle	Police, Fire, Maintenance, Operations	Trunked	806-821	Nextel	None
Vancouver WA	Clark Regional Communication Agency	PSAP, Police, Fire, EMS, Public Works, and Transit	Trunked Analog, Data	806-824	Nextel	None

Figure 3-1  
APCO Survey Results (Continued)

Location	Agency Name	Type of Service	Type of System	Frequency	Interference Source	Resolution
Vancouver	WA WSDOT	Highway Maintenance	EF Johnson Multinet	806-824	Nextel site at I-205 and SR 500	None
Green Bay	WI Green Bay Police	Police, Fire, EMS, Public Works, Transit, Parks	Trunked	810-816 855-861	Other Public Safety Agency	None

Figure 3-1  
APCO Survey Results (Continued)